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wherein data marks cause the first optical transducer to produce an unwanted data signal as the optical disk rotates, and the clock reference signal is separated from the unwanted data signal by detecting the clock reference signal using split detection.

REMARKS

The Examiner rejected claims 1-31 under 35 U.S.C. 102 (b) as being anticipated by Rijnsburger. Applicants respectfully disagree. Amended claim 1 includes the following features:

a recording layer having servo tracks; and

a clock reference structure formed along the servo tracks, the clock reference structure permitting data marks to be written to the recording layer in data fields of indeterminate length, <u>the reference clock structure permitting the generation of a clock reference signal which controls where first and second transition edges of data marks are written to the recording layer with sub-bit accuracy</u>.

(Emphasis added).

Support for this amendment can be found on page 11, lines 11-13, and on page 23, lines 1-4.

Amended claim 10 includes the following features:

an optical disk rotatably mounted on the recorder, the optical disk having a recording layer containing servo tracks;

a first optical transducer optically coupled to the recording layer of the optical disk, the first optical transducer following a servo track as the optical disk rotates;

a clock reference structure formed along the servo tracks providing data fields of indeterminate length, the clock reference structure causing the first optical transducer to produce a clock reference signal as the optical disk rotates;

means for recording data marks on the recording layer of the optical disk, wherein the

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data marks are recorded to include fundamental spatial frequencies less than a predetermined spatial frequency; and

a write clock which determines the placement of <u>first and second transition edges of data marks on the recording layer of the optical disk with sub-bit accuracy, the write clock being phase locked to the clock reference signal.</u>

Support for this amendment can be found on page 11, lines 11-13, and on page 23, lines 1-4.

Amended claim 24 includes the following features:

An optical disk recorder for receiving an optical disk which is rotatably mountable on the recorder, the optical disk comprising a recording layer having servo tracks and a clock reference structure having a spatial frequency which is greater than a predetermined spatial frequency, the clock reference structure being formed along the servo tracks and providing data fields of indeterminate length, the optical disk recorder comprising:

a first optical transducer which can optically couple to a recording layer of the optical disk, the first optical transducer following the servo tracks as the optical disk rotates, the clock reference structure causing the first optical transducer to produce a clock reference signal as the optical disk rotates;

means for writing data marks on the recording layer of the optical disk; and

a write clock which determines the physical placement of <u>first and second transition edges of data marks written on the recording layer of the optical disk with sub-bit accuracy, the write clock being phase locked to the clock reference signal.</u>

Support for this amendment can be found on page 11, lines 11-13, and on page 23, lines 1-4.

Applicants believes the invention to be patentable over Rijnsburger for the following reasons:

1. The clock reference structure of Rijnsburger is used for spindle control not for referencing data marks which are to be written or synchronizing a clock from which data marks are to be written.

The recording apparatus of Rijsnsburger includes a clock regeneration circuit for recovering the clock signal from the position-identifying signal and control circuit for controlling the scan velocity (see Rijnsburger, column 2, lines 14-17). The clock reference structure is not used for referencing data marks which are to be written.

2. Rijnsburger does not include a reference clock structure which controls where transition edges of data marks are written.

The clock reference structure of Rijnburger is not coupled to a write clock. The direction of the arrows in Figure 4 clearly show that the output of the phase detector 65 is connected to the speed control 67 not the read/write head 53. The clock reference structure is coupled through the position detection circuit and phase detector 65 to the speed control 67.

The read/write head is controlled by the oscillator 66 through a modulator 68. However, the oscillator 66 is not coupled to the clock reference structure. Therefore, there is no way that the clock reference structure can be used to control where first and second transition edges of data marks are written to the recording layer with sub-bit accuracy.

There is no suggestion in the prior art to modify it such as to produce Appellant's claimed invention.

The Examiner rejected claims 1-31 under 35 U.S.C. 102 (b) as being anticipated by Maeda et al. Applicants respectfully disagree.

Applicants believes the invention to be patentable over Maeda et al for the following reasons:

1. Maeda does not provide a reference structure which can generate a reference frequency high enough to write data marks to a recording layer with sub-bit accuracy.

In order for data marks to be written to a recording medium with sub-bit accuracy, the reference structure must include frequencies at least as great as a substantial portion of the frequency spectrum of the data. Maeda does not include a ~~reference structure~~ which has frequency components greater that the frequency of the data.

Maeda suggests a data frequency of 4.3218 MHZ and a clock reference frequency of 22.05 kHz (column 13, lines 24-31). The suggested data frequency is greater than the suggested clock reference frequency. Therefore, the reference clock of Maeda cannot be used for sub-bit accuracy in the placement of data marks to recording layer.

2. The structures taught by Maeda do not have the performance capability of the claimed invention.

Maeda suggests a reference frequency of data frequency of 4.3218 MHZ and a clock reference frequency of 22.05 kHz. The reference frequency and the clock reference frequency are a multiplication factor N of 196 apart (see column 13, lines 31-34). In order for the 22.05 kHz reference to be used to reference data written to the surface of a recording layer requires the reference to be multiplied by a factor of 196. As described in the specification (page 24, lines 12 ".....there is a practical limitation to the size of N due to the amplification of jitter and noise in the loop. For this reason, when a write clock frequency greater than the clock reference frequency is required, it is most advantageous to maximize the clock reference frequency. Therefore, N is minimized, which minimizes the jitter.

This creates a distinction between clock reference structures having fundamental frequencies significantly lower than the maximum data spatial frequency and the clock reference

structure of this invention. That is, the jitter produced by clock reference structures with fundamental spatial frequencies which are significantly lower than the maximum data frequency is likely to be too great to be of practical use in writing to an optical disk unless the data is divided into sectors which include edit gaps within them. However, the clock reference structure of this invention having spatial frequencies comparable to or greater than the maximum fundamental data spatial frequency will have less jitter and noise amplification in the harmonic locking phase-locked loop than a clock reference structure having a spatial frequency less than the maximum fundamental data spatial frequency. Therefore, the clock reference structure of the invention enables the production of a superior write clock."

In order for the structures taught by Maeda to use the clock reference frequency for writing data to the surface of the recording layer, the data must be sectored and include edit gaps. Sectoring and edit gaps do not allow for writing data fields of indeterminate length.

The Examiner rejected claims 1-31 under 35 U.S.C. 102 (e) as being anticipated by Carasso et al. Applicants respectfully disagree.

Applicants believes the invention to be patentable over Carasso et al for the following reasons:

1. Carasso teaches synchronization regions within data stored on a recording layer.

Figure 1a and Figure 1b clearly depict synchronization regions 8. In addition, the specification of Carasso discusses synchronization regions. "...within each sector such a record carrier has a synchronization area 8 in the form of an optically detectable relief structure." (See column 5, lines 51-54).

As described in the background of the specification (page 3, lines 3-5), "placement of data to be written on a recording layer of a re-writable optical disk is typically determined by including synchronization information between fixed-length data fields. A sector is a repeating unit of pre-determined length." By including sectors and

synchronization information between fixed-length data fields, the length of data fields is not indeterminate. That is, the length of the data field is determined by the placement of the synchronization information.

2. Carasso requires the data to be specially encoded such that nulls exist in the frequency spectrum of the data signal.

As shown in Figure 4 and Figure 8b of Carasso, the frequency spectrum of the data includes a null at the frequency of the reference clock frequency F_O. The present invention does not require the data to be encoded such that a null exists at the frequency of the reference structure. In fact, one of the embodiments of the invention (see the specification page 26, lines 24 though page 27, line 2) includes the clock reference structure having a spatial frequency which overlaps the spatial frequency spectrum of the data.

New claim 32 includes the feature that the first optical transducer coupled to data marks on the recording layer generates a data signal having a frequency spectrum in which the clock reference signal frequency is within fundamental frequency components of the frequency spectrum. None of the cited references include this feature.

Support for new claim 32 can be found on page 26, line 24 through page 27, line 2.

New claims 33 and 34 include the features of means for optically separating the data signal from the clock reference signal, and means for optically separating the clock reference signal the from the data signal. None of the cited references include these features.

New independent claim 35 includes the following features:

a recording layer having servo tracks;

a clock reference structure formed along the servo tracks, the clock reference structure

permitting data marks to be written and re-written to the recording layer in data fields of indeterminate length, the reference clock structure permitting the generation of a clock reference signal which controls where first and second transition edges of data marks are written to the recording layer with sub-bit accuracy;

a first optical transducer coupled to the clock reference structure generating a clock reference signal comprising a clock reference signal frequency; and wherein

the first optical transducer coupled to data marks on the recording layer generates a data signal having a frequency spectrum in which the clock reference signal frequency is within fundamental frequency components of the frequency spectrum.

Support for this new claim can be found on page 26, line 24 through page 27, line 2.

None of the cited references include a first optical transducer coupled to data marks on the recording layer generates a <u>data signal having a frequency spectrum in which the clock reference signal frequency is within fundamental frequency components of the frequency spectrum</u>.

New <u>independent</u> claim 36 includes the following features:

an optical disk rotatably mounted on the recorder, the optical disk having a recording layer containing servo tracks, the servo tracks comprising grooves;

a first optical transducer optically coupled to the recording layer of the optical disk, the first optical transducer following a servo track as the optical disk rotates;

a clock reference structure comprising edges of the grooves which oscillate in-phase formed along the servo tracks, the clock reference structure providing data fields of indeterminate length, the clock reference structure causing the first optical transducer to produce a clock reference signal as the optical disk rotates;

means for recording data marks on the recording layer of the optical disk, wherein the data marks are recorded to include fundamental spatial frequencies less than a predetermined spatial frequency;

a write clock which determines the placement of data marks on the recording layer of the optical disk, the write clock being phase locked to the clock reference signal; and

wherein data marks cause the first optical transducer to produce an unwanted data signal as the optical disk rotates, and the clock reference signal is separated from the unwanted data signal by detecting the clock reference signal using radial push-pull detection.

None of the cited references include the feature that data marks cause the first optical transducer to produce an unwanted data signal as the optical disk rotates, and the clock reference signal is separated from the unwanted data signal by detecting the clock reference signal using radial push-pull detection.

New <u>independent</u> claim 37 includes the following features:

an optical disk rotatably mounted on the recorder, the optical disk having a recording layer containing servo tracks, the servo tracks comprising grooves;

a first optical transducer optically coupled to the recording layer of the optical disk, the first optical transducer following a servo track as the optical disk rotates;

a clock reference structure comprising edges on the grooves which oscillate substantially 180 degrees out-of-phase formed along the servo tracks, the clock reference structure providing data fields of indeterminate length, the clock reference structure causing the first optical transducer to produce a clock reference signal as the optical disk rotates;

means for recording data marks on the recording layer of the optical disk, wherein the data marks are recorded to include fundamental spatial frequencies less than a predetermined spatial frequency;

a write clock which determines the placement of data marks on the recording layer of the optical disk, the write clock being phase locked to the clock reference signal; and

wherein data marks cause the first optical transducer to produce an unwanted data signal as the optical disk rotates, and the clock reference signal is separated from the unwanted data signal by detecting the clock reference signal using split detection.

None of the cited references include the feature that data marks cause the first optical transducer to produce an unwanted data signal as the optical disk rotates, and the clock reference signal is separated from the unwanted data signal by detecting the clock reference signal using split detection.

Amended and new independent claims 1, 10, 24, 35, 36, 37 should be allowable.

Claims 2-9, 11-23, 25-34 are directly or indirectly dependent on independent claims 1, 10, 24, 35, 36, 37. Therefore, claims 2-9, 11-23, 25-34 should be allowable.

None of the references cited by the Examiner teach or suggest the inventive concepts of the present invention.

No new information has been added with these amendments.

The Applicants respectfully request reconsideration of the claims in view of the remarks made herein. A notice of allowance is earnestly solicited.

Respectfully submitted,

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Dated: 4/6/99

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